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# SEAL PLATE FOR BEARING AND SEAL PLATE ATTACHMENT METHOD
[Bearingu yo shiru pureto oyobi shiru pureto no toritsuke hoho]

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1. Title of the Invention /1*

Seal Plate for Bearing and Steel Plate Attachment Method

2. Claims

(1) A seal plate for a bearing comprising a steel seal plate body (5); a lug piece (1) formed on an outer circumferential edge of the seal plate body (5), having a cross-section shape which is substantially an L-shape comprising a vertical portion (1a) and a horizontal portion (1b), and having a fitting groove (3) with a cross-section shape which is substantially a horizontal U-shape or a horizontal V-shape comprising a horizontal portion (3a), a circular arc portion (3b), and an oblique portion (3c), formed on an end face of an inner circumferential face of an outer ring (C), the vertical portion (1a) being fit into the fitting groove (3) when bent into a substantially ring shape; and a shallow groove (4) having a cross-section which is arcuate formed on an outer surface of the vertical portion (1a) of the lug piece (1).

(2) A seal plate attachment method, wherein a lug piece (1) comprising a vertical portion (1a) and a horizontal portion (1b) and having a substantially L-shaped cross-section having an arcuate shallow groove (4) on an outer surface of the vertical portion (1a) is formed on an outer circumferential edge of a steel seal plate body (5), a fitting groove (3) having a substantially horizontal U-shaped or horizontal V-shaped cross-section comprising a horizontal portion

* Claim and paragraph numbers correspond to those in the foreign text.

(3a), a circular arc portion (3b), and an oblique portion (3c) is formed on an end face of an inner circumferential face of a bearing outer ring (C), the vertical portion (1a) being bent into a ring shape and secured inside the fitting groove (3) by the elastic force of the lug piece (1) thus bent into a ring shape by mounting the vertical portion (1b) of the lug piece (1) on the vertical portion (3a) of the fitting groove (3) and pressing the vertical portion (1a) from above.

3. Detailed Description of the Invention

(Industrial Field of Use)

The present invention relates to improvements to a steel seal plate for a bearing and an attachment method thereof, and is mainly used in small bearings.

(Prior Art)

Steel seal plates for bearings such as that shown in Fig. 5 have been widely used in dust-proof bearings. Specifically, a fitting lug piece 1 is formed on a pressed thin steel seal plate A, a squared /2 concave groove 2 is formed on an outer surface of the fitting lug piece 1 in advance, an end portion of the lug piece 1 is pressed using a press B as shown in Fig. 6 to bend it into a U-shape, and the lug piece 1 is fit into a fitting groove 3 of an outer ring C by putting it into the shape shown by the dotted line using the elasticity thereof, thereby securing it (JP 50-21609 A, etc.).

Incidentally, in the case of relatively large bearings and a large thickness T of the outer ring C, this conventional steel seal plate provides outstanding practical effectiveness, completely lacking problems such as uneven circularity in the outer ring C when fitting the seal plate or looseness due to decreased fitting power during use.

However, if the bearing is small, the thickness T of the outer ring C is around 0.5-1.0 mm, and a thickness D of the lug piece 1 of the seal plate A is around 0.4-0.8 mm, then unevenness in the circularity of the outer ring C becomes a significant problem, as does the degree of the fitting power (elastic power) of the lug piece 1 bent into a U-shape, which creates the problem of the seal plate A, which is constituted by providing the concave groove 2 to the lug piece 1 and fitting the lug piece 1 into the fitting groove 3 in the outer ring C by bending the lug piece 1 into a U-shape, being realistically impractical in terms of precision and fitting power.

(Problem to be Solved by the Invention)

The present invention solves the problem of a case in which a conventional steel seal plate is applied to a small bearing, namely the problems of the circularity of the outer ring when fitting the seal plate and looseness during use, and provides a steel seal plate and attachment method thereof in which an arcuate shallow groove is formed in an outer face of a lug piece 1 of the seal plate body A, and the lug piece 1 is fitted into a fitting groove 3 in an outer

ring C by bending the lug piece 1 into a ring shape, thereby eliminating unevenness in the circularity of the outer ring even when a thickness T of the outer ring C and a thickness D of the seal plate A are thin, and moreover making it possible to fit the lug piece 1 into the fitting groove 3 securely.

(Means for Solving the Problem)

As a basic constitution, the seal plate for a bearing of the present invention comprises a steel seal plate body (5); a lug piece (1) formed on an outer circumferential edge of the seal plate body (5), having a cross-section shape which is substantially an L-shape comprising a vertical portion (1a) and a horizontal portion (1b), and having a fitting groove (3) with a cross-section shape which is substantially a horizontal U-shape or a horizontal V-shape comprising a horizontal portion (3a), a circular arc portion (3b), and an oblique portion (3c), formed on an end face of an inner circumferential face of an outer ring (C), the vertical portion (1a) being fit into the fitting groove (3) when bent into a substantially ring shape; and a shallow groove (4) having a cross-section which is arcuate formed on an outer surface of the vertical portion (1a) of the lug piece (1).

As a basic constitution, the seal plate attachment method of the present invention is such that a lug piece (1) comprising a vertical portion (1a) and a horizontal portion (1b) and having a substantially L-shaped cross-section having an arcuate shallow groove (4) on an

outer surface of the vertical portion (1a) is formed on an outer circumferential edge of a steel seal plate body (5), a fitting groove (3) having a substantially horizontal U-shaped or horizontal V-shaped cross-section comprising a horizontal portion (3a), a circular arc portion (3b), and an oblique portion (3c) is formed on an end face of an inner circumferential face of a bearing outer ring (C), the vertical portion (1a) being bent into a ring shape and secured inside the fitting groove (3) by the elastic force of the lug piece (1) thus bent into a ring shape by mounting the vertical portion (1b) of the lug piece (1) on the vertical portion (3a) of the fitting groove (3) and pressing the vertical portion (1a) from above.

(Operation)

When a vertical portion 1a of a lug piece 1 is pressed down, the vertical portion 1a is bent into a substantially ring shape along a fitting groove 3 due to the presence of an arcuate shallow groove 4, the bearing axial line and the vertical force almost completely not acting upon the fitting groove 3. As a result, an end portion of an outer ring C is not pushed outward, and no unevenness in the circularity thereof is caused.

The outer circumferential portion of the lug piece 1 bent into a ring shape abuts a horizontal portion 3a and an oblique portion 3c thereof at positions inside the fitting groove 3, and is secured inside the fitting groove 3 due to increased elastic power.

(Examples)

Examples of the present utility model [sic] are described below with reference to the drawings. Note that in Figs. 1-5 the same reference numerals are used for the same parts in Fig. 5 and Fig. 6.

Fig. 1 is a partial cross-section view of a seal plate A /3 according to the present invention. 1 is a lug piece of the seal plate, 4 is a shallow groove formed by pressing an outer face of the lug piece 1, and 5 is a steel seal plate body.

The seal plate A is formed as a single unit by pressing steel plates having a thickness of approximately 0.4 mm, the shallow groove 4 being formed either simultaneously or in advance as appropriate.

The lug piece 1 is formed from a vertical portion 1a and a horizontal portion 1b, and the shallow groove 4 is formed on an outer face of a central portion of the vertical portion 1a. Note that the shallow groove 4 is not an angular concave groove, but rather a shallow groove having a cross-section shape that is a continuous arc shape as shown in Fig. 3, the maximum depth P thereof being selected to 0.1-0.2 mm. Furthermore, the vertical portion 1a need not be literally vertical, and it is also possible to bend the top portion thereof slightly outward.

A fitting groove 3 having a substantially horizontal U-shaped (or horizontal V-shaped) cross-section comprising a horizontal portion 3a, a circular arc portion 3b, and an oblique portion 3c as shown in Fig. 2 is formed in an inner circumferential surface of an end portion of a bearing outer ring C.

When fitting the seal plate A into the fitting groove 3 of the bearing outer ring C, the horizontal portion 1a of the lug piece 1 formed into a substantially L-shape is mounted on the horizontal portion 3a of the fitting groove 3 having a substantially horizontal U-shaped (or horizontal V-shaped) cross-section as shown in Fig. 2, the vertical portion 1b of the lug piece 1 is pressed downward by a press mold B, thus causing an end face of the vertical portion to abut the side of the horizontal portion 1a.

The vertical portion 1b of the lug piece 1 of the seal plate A is thus bent into a ring shape along the fitting groove 3, curled into the state shown in Fig. 3, and securely fixed into the fitting groove 3 by the elastic power of the lug piece 1 thus curled.

In other words, because an arcuate shallow groove 4 is formed in the outer face of the vertical portion 1b of the lug piece 1, the vertical portion 1b is formed into an extremely smooth ring shape, with no significant force in the direction marked by the arrow X (the shaft center of the bearing and the vertical direction) acting upon the inner circumferential surface of the fitting groove 4 [sic] even if the top portion of the vertical portion 1b of the lug piece 1 is pressed downward. As a result, the end portion of the outer ring C is not forced out in the direction of the arrow X, and almost no unevenness is created in the circularity thereof.

Furthermore, the lug piece 1 of the seal plate A is held inside the fitting groove 3 of the outer ring C curled into a ring shape,

and therefore a stronger elastic force acts in the direction of arrow Y compared to a case in which the conventional lug piece 1 is bent into and held in a U-shape, and furthermore the outer circumferential face of the ring-shape bent part abuts the horizontal portion 3a of the inner circumferential face of the fitting groove 3 and an inner position 3c' of an upper shoulder portion, thus providing extremely secure support. Note that Fig. 3 provides an approximately 50X magnification of the 0.4-mm-thick steel plate A fitted into the fitting groove 3 of the outer ring C having a thickness D of 0.6 mm.

In contrast, in a case in which the arcuate shallow groove 4 is not provided to the outer face of the vertical portion 1b of the lug piece 1, attempting to fit this into the fitting groove 3 using the same method as in the case of Fig. 3 results in the state shown in Fig. 4, with the ring-shaped bent portion abutting the upper shoulder portion 3d on the inner circumferential face of the fitting groove 3. As a result, during fitting, the end portion of the outer ring C is forcefully pressed in the direction of the arrow X, causing unevenness in the circularity thereof, and causing the fit of the seal plate A to be remarkably unstable.

For example, if the seal diameter is 15 mm, the thickness D of the outer ring C is 0.6 mm, and the thickness of the seal plate is 0.4 mm, then if the arcuate shallow groove 4 is not provided to the outer face of the vertical portion 1a of the lug piece 1, approximately 30% of the seal plate fitted into the outer ring C will

be loose or come out during use, and furthermore approximately 90% or more of the outer ring C will undergo deformation beyond the tolerance limit.

In contrast, with the present invention, there is absolutely no looseness during use, and absolutely no deformation beyond the tolerance limit of the outer ring C.

(Effect of the Invention)

With the present invention, the arcuate shallow groove 4 is provided to an outer face of the vertical portion 1a of the lug piece 1 of the seal plate, and the vertical portion 1a of the lug piece 1 is pressed downward, bending it into a ring shape, and thus securing it into the fitting groove 3 of the outer ring C, and therefore the lug piece 1 is smoothly curled into a ring shape along the fitting groove 3 when fitting the seal plate. The force in an outward direction (shaft center and vertical direction) acting on an outer /4 end portion of the outer ring C is thereby minimized. As a result, unevenness in the circularity thereof is nonexistent even in the case of a small outer ring, making it possible to significantly improve product quality.

Furthermore, the lug piece 1 of the seal plate is bent into a ring shape when fully fitted into the fitting groove 3 of the outer ring C, and the elastic force thereof is very strong. As a result, the fitting force of the seal plate increases, making looseness or disengagement of the seal plate during use of the bearing unlikely.

The present invention provides these outstanding practical effects.

4. Brief Description of the Drawings

Fig. 1 is a vertical cross-section view showing one part of the seal plate for a bearing according to the present invention, and Fig. 2 is a descriptive view of a step of fitting a seal plate A into an outer ring C.

Fig. 3 is a partially expanded view of a lug piece portion of the seal plate A according to the present invention fitted into an outer ring C.

Fig. 4 is a partially expanded view of the lug piece portion in a case in which a seal plate not according to the present invention is fitted into the outer ring C.

Fig. 5 is a vertical cross-section view showing part of the conventional seal plate, and Fig. 6 is a descriptive view showing the conventional seal plate A fitted into an outer ring.

A seal plate

C outer ring

1 lug piece of seal plate

1a vertical portion

1b horizontal portion

3 fitting groove

3a horizontal portion

3b circular arc portion

3c oblique portion

4 arcuate shallow groove

5 seal plate body

Fig. 1

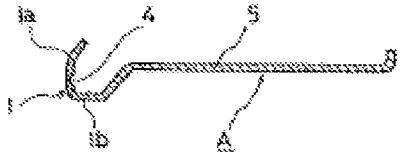


Fig. 2

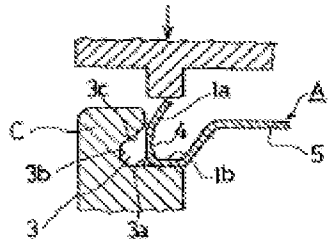


Fig. 5

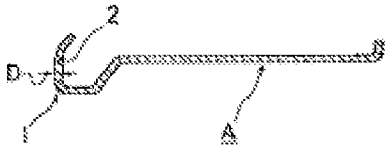


Fig. 6

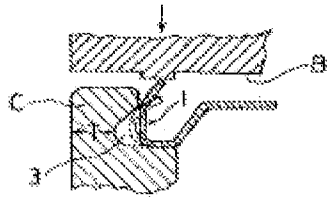

Fig. 3

/5

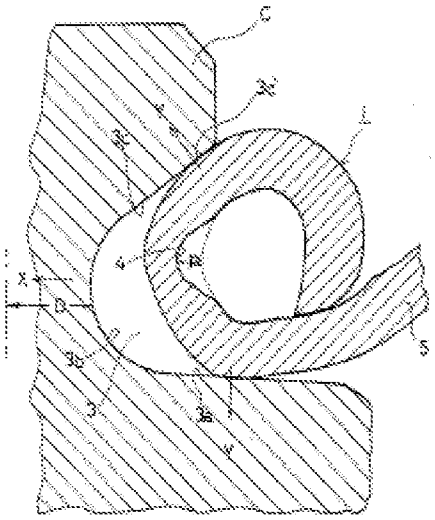


Fig. 4